

EXAMINERS' REPORT

AM CHEMISTRY

FIRST SESSION 2018



L-Università
ta' Malta

**MATSEC
Examinations Board**

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General Statistics

The distribution of grades awarded in the May 2018 session is given in the table below.

Table 1: Distribution of grades

GRADE	A	B	C	D	E	F	abs	TOTAL
NUMBER	62	73	117	67	54	70	21	464
% OF TOTAL	13.4	15.7	25.2	14.4	11.6	15.1	4.5	100

General Comment by Markers

Paper 1

Question 1 was on the whole well answered with an average mark of 7/10. In part (b), several candidates were unable to give the nuclear equation for the decay reaction, whilst in part (c) several gave the equation for IE without the (g) state symbol.

Question 2 was on the whole well answered with an average mark of 8/11. In part (d), quite a few candidates were not able to explain why CO₂ is non-polar. Meanwhile in part (e), most candidates failed to explain why SO₂ is V shaped and CO₂ is linear, starting the explanation from the number of electrons in the valence shells.

Question 3 was reasonably answered with an average of 6/11. In part (c), most answers were not in terms of petrol disrupting H-bonding in methanol.

Question 4 was poorly answered with an average of 4/11. In parts (a) and (b), most candidates were not familiar with chemistry of Li.

Most candidates obtained average marks for question 5 and the average was 7/14. In part (a,) octahedral shape was not shown in most diagrams; dative bonds were directed to H of H₂O in quite a few diagrams. In general, candidates struggled with question on chromium chemistry; even the part (d) about electrochemistry.

Question 6 was well answered with an average mark of 7/10. In some cases, answers for parts (c)(i) and (c)(ii) were too brief and not up to the expected standard.

The performance in question 7 was on the whole average with an average mark of 5/10. In part (c), almost all candidates were unable to explain that I⁻ may attack from different and opposite sides of the plane. Meanwhile in part (e), several answers were not in terms of the possibility of nucleophilic attack.

The average mark in question 8 was 5/10. In part (a), a fair number of candidates swapped R and S in their answers. In part (c), a fair number of respondents were unfamiliar with the Hoffman reaction and did not answer parts (c)(ii) and (iii) correctly.

On the whole, question 9 was poorly answered with an average mark of 5/13. In part (a), many thought that W was phenylethanal and incorrectly gave the triiodomethane reaction for phenylethanal. In part (d), several candidates were unable to work out the polymerisation steps.

Paper 2

Question 1 was a popular choice with candidates with 96% of candidates opting to answer this question. The average mark was 11/20. In parts (a) and (b), most of the candidates who attempted this question on acids and bases worked out the pH of the weak acid correctly. Fewer candidates were able to calculate the pH of the buffer correctly. Most were not able to calculate the number of moles of unreacted acid and the formed ethanoate. Most candidates gave a correct definition for conjugate base in part (c), but few candidates were able to calculate K_b of the propanoate ion using K_w and K_a . In part (d), some respondents were able to conclude that the dissociation of water is an endothermic process but did not explain why water is neutral at higher temperatures.

Question 2 was also quite a popular option with 80% of candidates answering the question. The average mark was 9/20. Most respondents gave a correct phase diagram of carbon dioxide. Few candidates were able to express K_d correctly and to use it appropriately to calculate the mass of B remaining in the water layer after the solvent extraction procedure. In part (c), most candidates knew how to use Raoult's law to calculate the composition of the vapour but were not able to work the mole fractions in the mixtures correctly. Several candidates who attempted this question answered this part (d) correctly.

This question was answered by 36.5 % of the candidates and the average mark was 4/20. In general candidates were very brief and did not give essential detail on observations in their answers to this question. Part (a) was answered quite well. In most cases candidates did not give equations for part (b). Several candidates gave the silver nitrate test only to distinguish between the sodium halides. In this test, most candidates did not confirm the solubility of the precipitates in nitric acid and in aqueous ammonia. Part (d) was in most cases illogically answered.

Question 4 was selected by 17% of the candidates. The question was on the whole poorly answered with an average mark of 6/20. Few respondents attempted this question. In most cases, candidates did not describe the necessary precautions to keep anhydrous conditions for the preparation of aluminium chloride. Few respondents gave the appropriate amount of detail and equations for parts (b), (c) and (d). Parts (c) and (e) were answered poorly.

Question 5 was another popular choice with 87% of candidates answering this question. The average mark was 9/20. Part (a) was in most cases answered correctly. In part (b), some candidates gave a secondary or a tertiary haloalkane instead of a primary haloalkane. Some candidates also erroneously described a S_N1 mechanism. Answers indicated that candidates may not be familiar with the term molecularity. In part (c), most candidates presented the Maxwell-Boltzman distribution curves but did not explain the curves in terms of increase in temperature or fraction of molecules with energy greater or equal to E_a or refer to the Arrhenius equation.

Question 6 was answered by 66% of the candidates. The average mark was a reasonable 10/20. In part (a), several candidates were able to give the di-ol as an answer but did not continue the reaction to show the formation of the monoester and the diester. Very few candidates related the solubilities of the esters to the presence/absence of the OH group. In part (b), quite a few respondents incorrectly gave the dinitro and the trinitro products as answers. Most respondents were able to answer part (c) correctly. Several respondents were able to draw the structure of azo compound, but were not able to state why the azo compound is not formed if the reactants are heated.

Question 7 was answered by 53% of the candidates and the average mark was 7/20. Most respondents obtained most of the marks for parts (a)(i) and (a)(ii). Fewer candidates answered part (a)(iii) correctly. In general, candidates tended not to mention Room Temperature as a condition. Also, most candidates did not emphasise the use of anhydrous conditions. In part (b), some candidates did not divide the organic product in two parts, but incorrectly introduced a second organic compound in the synthesis.

Question 8 was answered by 60% of candidates and the average mark was 8/20. In general, respondents who stated that K is phenylethanoic acid, were not able to complete the question beyond the formation of compound O. On the other hand, most candidates who stated that K was methyl benzoic acid did not give reasons to justify their choice. Most respondents did not identify the dehydrated products Q and R.

Paper 3

The practical paper contained three compulsory questions, namely Question 1 on volumetric analysis and Questions 2 and 3 on the qualitative analysis of inorganic and organic substances respectively.

The average mark for Question 1 was 37/50. While most of the candidates successfully completed the titration exercises, marks were lost in working out the calculations. Several candidates did not attempt the calculations.

Question 2 was answered very well with the average mark being 25/29. Most candidates managed to at least identify 2 to 3 correct ions out of 4. Marks were lost in parts (a) and (b) concerning the identification of the iron(II) and ammonium ion respectively. In part (a), candidates correctly noted the colour observed but then misidentified the ion while for part (b) candidates reported seeing a red to blue change in litmus but could not correctly identify the ion.

Question 3 was answered fairly well with the average mark being 13/21. In addition, candidates had problems reporting succinct observations and linking the observations with the physical and chemical properties of the compound under study. This was the case for part (a) – the solubility test. In this instance many candidates did not correctly deduce that the compound under study was non polar. Similarly, in part (b) – testing in acid - candidates did not note that the compound is soluble in acid and the implication that protonation took of a basic group took place. This explains the difficulty encountered in part (c) – testing in a base. Meanwhile, parts (d) and (e) were well-answered.

Chairperson

2018 Examination Panel